

## NON-DEVELOPMENTAL/OFF-THE-SHELF LAMP MONITOR

A SINGLE POLE, SURFACE MOUNT, MOLDED CASE CIRCUIT BREAKER or DISCRETE DEVICE to PERFORM the SAME FUNCTIONS.

### **REQUEST FOR INFORMATION ONLY / SOLICITATION NOT APPLICABLE.**

The FAA is requesting information concerning the availability of non-developmental/commercial off-the-shelf (COTS) lamp monitoring device. A single pole; surface mount, molded case, circuit breaker or a discrete device that is capable of performing the same functions are needed.

Background: The FAA has historically used various combinations of fuses, potential and current relays, and circuit breakers to detect open lamp filaments in aviation visual aids equipment. Remote monitoring of this equipment requires a contact opening or equivalent to provide a signal. The availability and use of power quality survey instruments has revealed the waveforms of voltage and current are quite similar over a wide range of equipment. The lamps used in this range of equipment are identical, as to type and design from a load standpoint, in every discrete wattage size.

The FAA has well over 2,000 systems, ranging in size from 6 to 48 lamps each, in use. There is no standard method of detecting open lamp filaments within systems of varying age, or between systems. The similarities of voltage waveforms, and simplicity of the basic circuit, lead to the conclusion that one or two standard single pole circuit breakers with 10 ampere rated contacts would provide a standard configuration of detection and alarm for all systems. A discrete device designed to perform the same functions for one to three lamps could also be a solution.

The waveforms of voltage all have a higher than normal peak voltage in normal operation due to the distortion produced by the Triac voltage regulation which maintains constant current. This application requires a fast trip time when a lamp filament fails open, but must not produce false trips due to the higher than normal peak voltage in normal operation.

There are a myriad of circuit breaker trip curves available. The number is so large that it is not practical to obtain all that may be available, or to make the best application of a standard design that will continue to be manufactured for an extended period of time.

This request for information (RFI) is focused on the following requirements:

**A circuit breaker with main poles in parallel with the lamp filament is illustrated to define the circuit requirements. Discrete devices that perform the same functions in the same environmental conditions are a viable alternative solution.**

A ballast resistor or inductance in series with the breaker main poles may be required. The auxiliary contacts required are a Normally Open (form A) and a Normally Closed (form B). They must have electrical isolation from each other. The normally open contact must close when the circuit breaker trips and short the failed lamp's socket. This contact must have a minimum continuous carry rating of ten (10) amperes AC.

The normally closed contact that opens when the circuit breaker is tripped will be used for a low DC voltage/current alarm circuit. One (1) ampere at 250VDC interruption capacity is desired. Standard units with an additional set of auxiliary contacts might allow further refinement of the power supply circuit. Contact capacity for this application would be similar to the 1 ampere at 250VDC requirement and these contacts should also be electrically isolated from each other.

Trip time, and contact transfer times, must be as rapid as possible without compromising the application by producing false trips. False trips caused by responding to the inrush current of the lamp(s) cannot be tolerated. Lamp cold filament resistance will be  $1/16^{\text{th}}$  of the full power filament resistance.

The device(s) will be surface mounted in outdoor applications in unheated weatherproof enclosures. Outdoor ambient air temperatures will range from -60°F (-51°C) to +120°F (+49°C). The voltage to ground of the lamp series circuit will not exceed 600volts rms.

There is potential for substantial requirements for standard single pole circuit breakers with auxiliary contacts for use as open circuit detectors in series lamp circuits. The potential numbers of units that may be required are estimated to be between 9,000 and 36,000.

Response guidelines: Vendors having non-developmental single pole circuit breakers with auxiliary contacts or alternatives are encouraged to provide information on the capabilities of their product to meet the aforementioned requirements, i.e., both required and preferred.

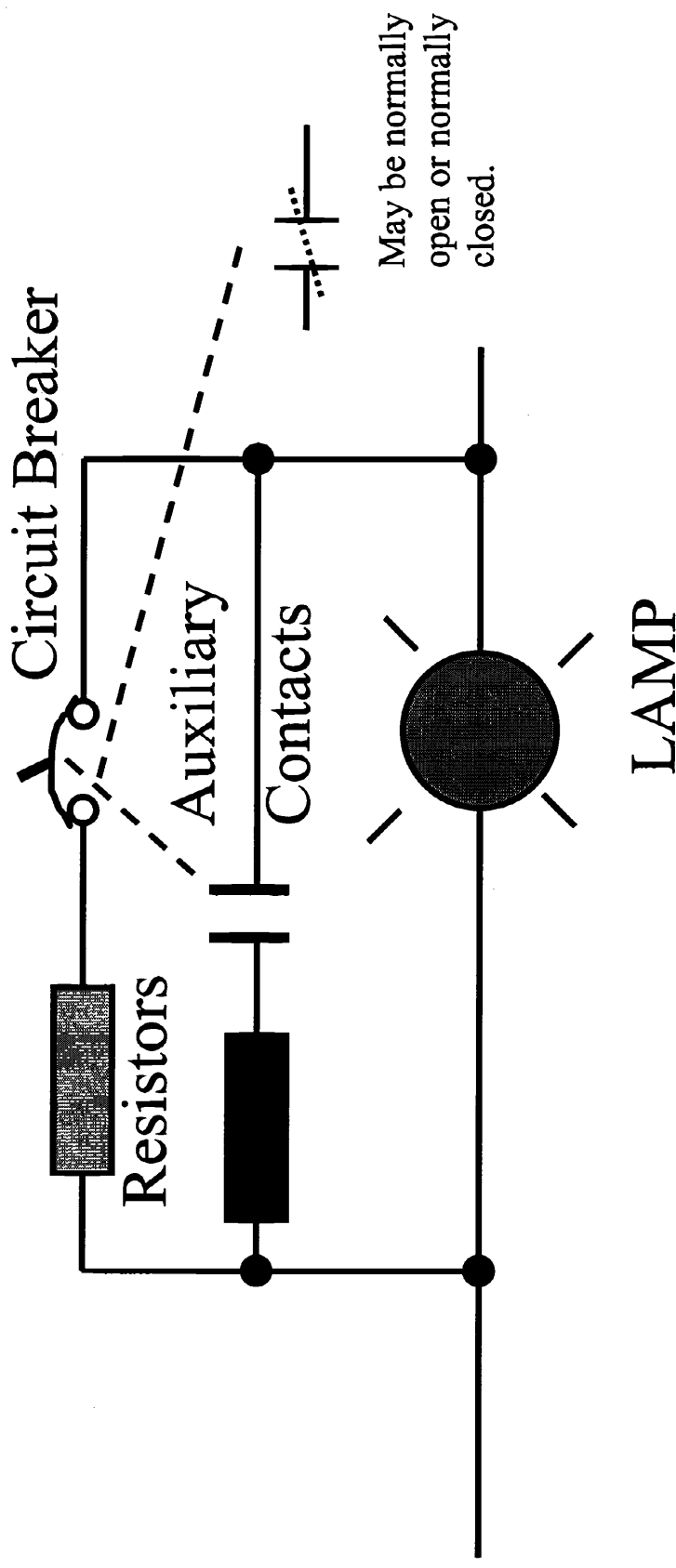
Vendors whose product is determined to have potential may later be afforded an opportunity to submit samples of their respective brands/models for testing. All sample units would be tested at normal room temperatures. Samples with closely matching time and stability performance would then be subjected to testing at the extremes of ambient temperature.

For those submitting responses to this request for information (RFI), it is preferred that a matrix be provided which lists each attribute/feature described above with corresponding “yes” or “no” as to applicability to vendor’s product. Responses will be evaluated from those firms whose product is determined to have the potential for fulfilling the FAA’s requirements.

This RFI is for planning purposes only and shall not be construed as a request for proposal or as an obligation on the part of the FAA to acquire any follow-on acquisitions. No entitlement to payment of direct or indirect costs or charges by the FAA will arise as a result of submission of responses to this RFI and the FAA’s use of such information. This RFI does not constitute the solicitation of proposals. The Contracting Officer must receive written responses by January 15, 2004. Responders to this RFI may be requested to provide additional details/information based on their initial submittals.

This RFI was issued by Mike J. Rogers, Contracting Officer, (405) 954-7830, e-mail: [Mike.J.Rogers@faa.gov](mailto:Mike.J.Rogers@faa.gov), Federal Aviation Administration (FAA), NAS, Automation & Facilities Acquisition Division (AMQ-210), P.O. Box 25082, 6500 S. MacArthur Blvd., Oklahoma City, OK 730125.

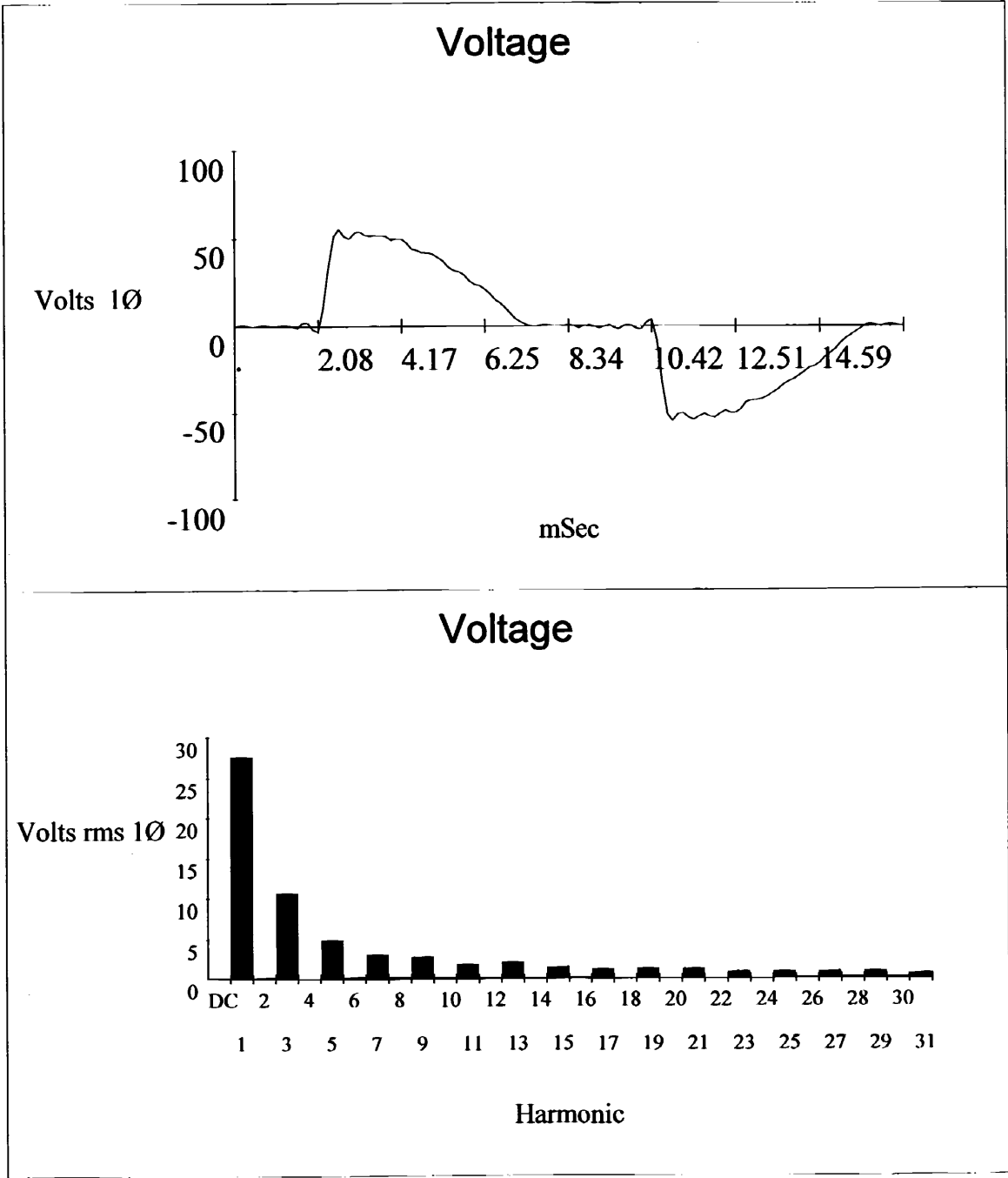
A copy of the response should be directed to Earl D. Evans, E.E. (405-954-7911, Quality Systems Group (AML-30), e-mail: [Earl.D.Evans@faa.gov](mailto:Earl.D.Evans@faa.gov). P.O. Box 25082, 6500 S. MacArthur Blvd., Oklahoma City, OK 73125. Additional technical information will be furnished responders as requested.



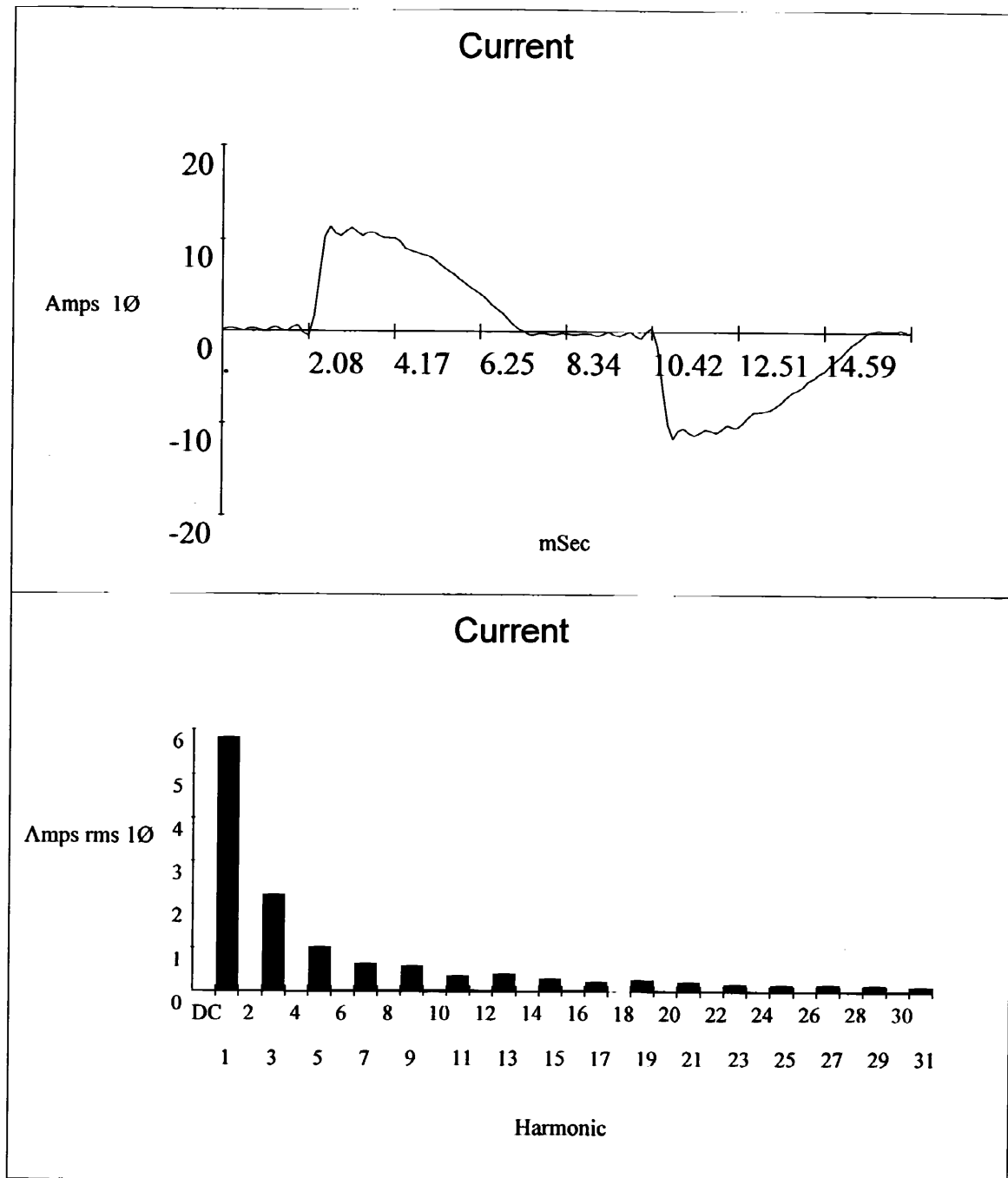
**Principle of Operation.** The circuit breaker has a minimum of a normally open auxiliary contact. This contact is open when the circuit breaker is reset (or closed). One Resistor limits the current conducted by the breaker when the lamp is operating normally. The other resistor duplicates the lamp load when the breaker is tripped.

When the lamp filament opens, the current conducted by the circuit breaker increases to the point the breaker trips (opens). When the breaker trips the Auxiliary Contact closes and conducts the lamp current. An additional contact can be used for monitoring circuits.

When the lamp is replaced, the circuit breaker is reset.



FA-10041 VASI  
High Step  
Single Lamp Readings



FA-10041 VASI  
High Step  
Single Lamp Readings

# Single Phase Readings - 05/03/00 10:09:55

FA-10041 VASI  
High Step  
Single Lamp Readings

## Summary Information

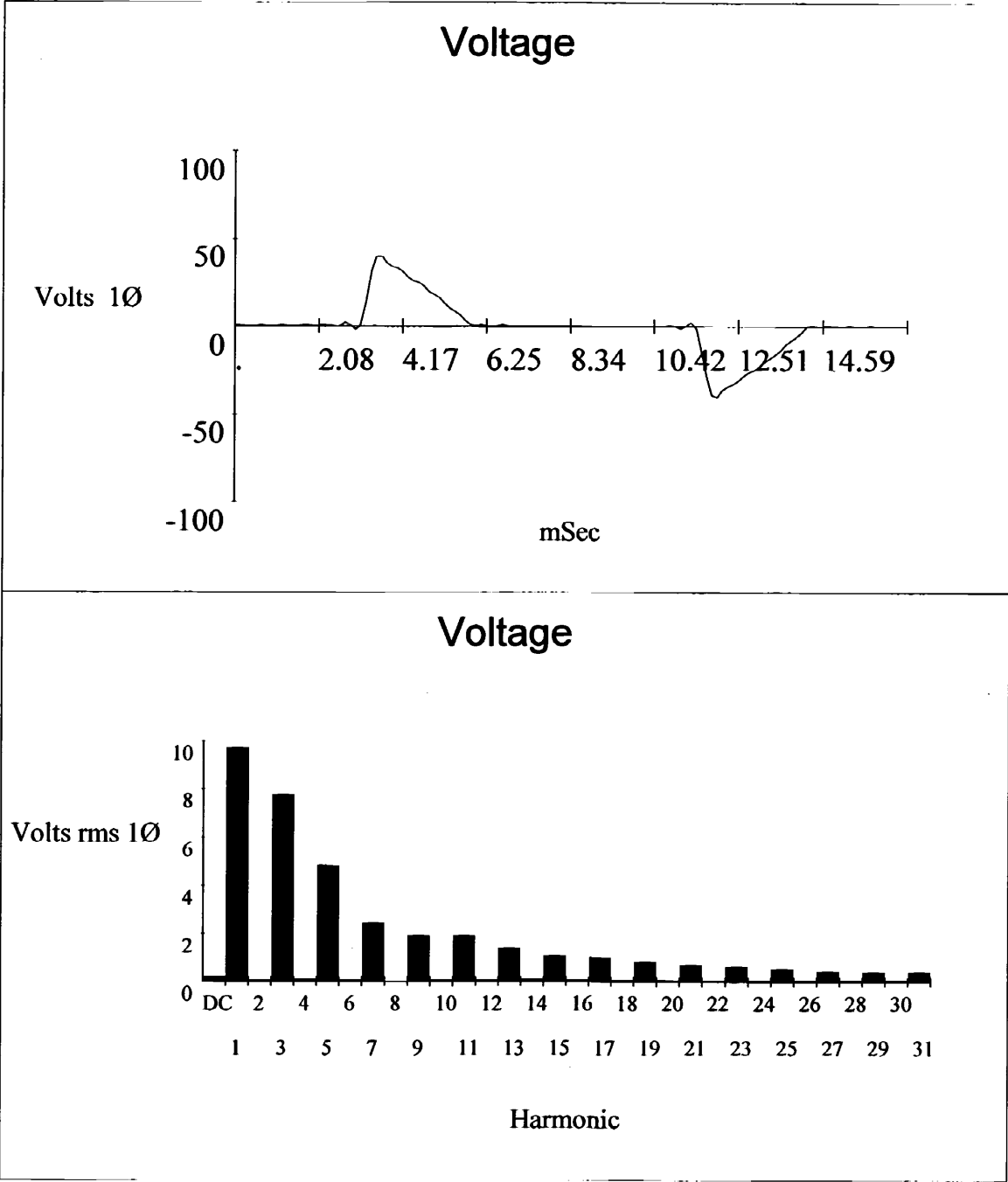
			Voltage	Current
Frequency	59.96	RMS	30.53	6.44
Power (1 Phase)		Peak	54.75	11.70
KW	0.20	DC Offset	0.05	-0.03
KVA	0.20	Crest	1.79	1.82
KVAR	0.00	THD Rms	42.33	42.26
Peak KW	0.65	THD Fund	46.72	46.63
Phase	1° lead	HRMS	12.91	2.72
Total PF	1.00	KFactor		8.86
DPF	1.00			

## Record Information

	Max	Average	Min
V RMS			
A RMS			
V Peak			
A Peak			
V THD-R%			
A THD-R%			
KWatts			
KVA			
TPF			
DPF			
Frequency			

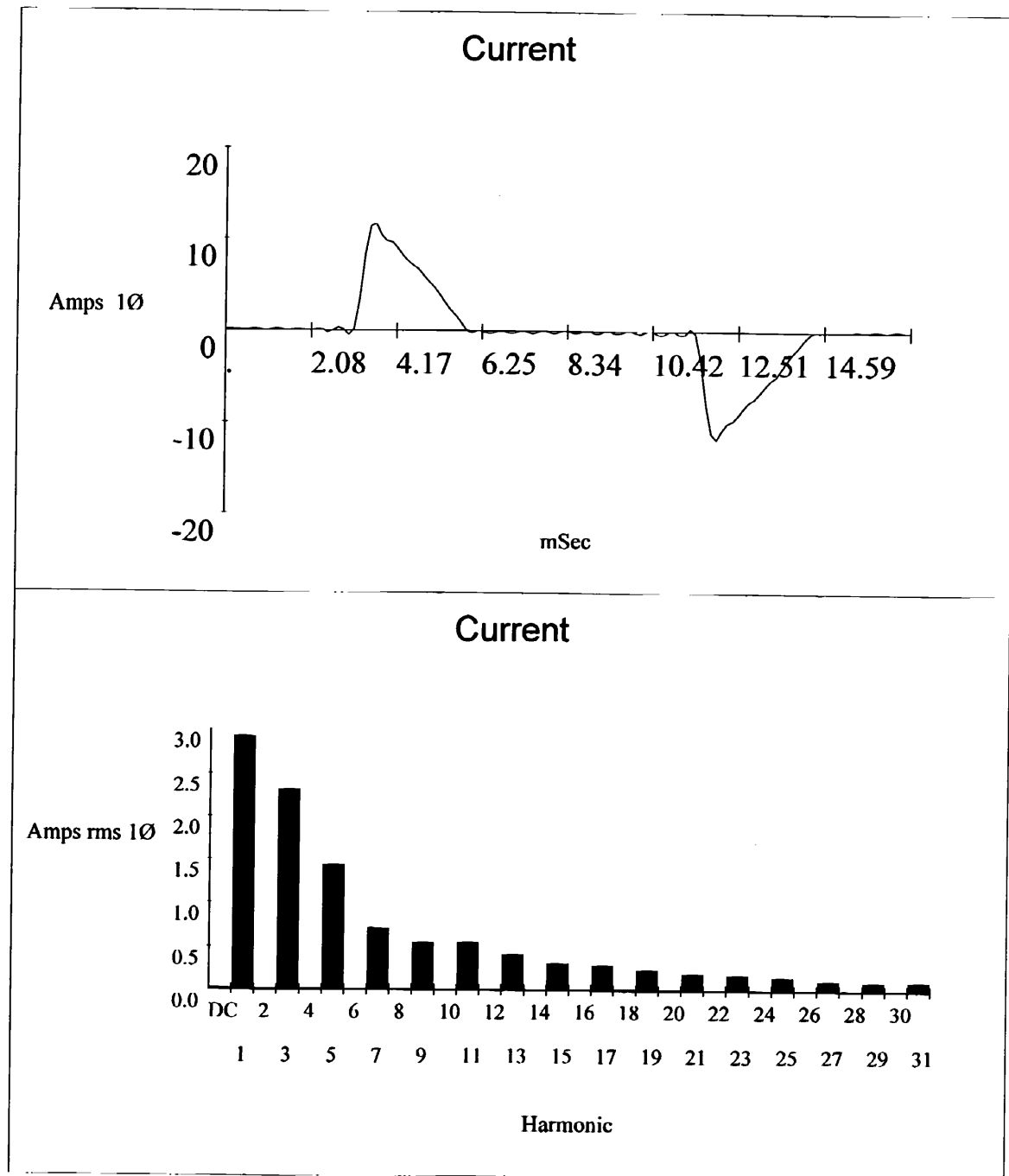
## Harmonic Information

	Freq.	V Mag	%V RMS	1 Phase V Ø°	I Mag	%I RMS	1 Phase I Ø°	1 Phase Power (KW)
DC	0.00	0.05	0.18	0	0.03	0.44	0	0.00
1	59.96	27.64	90.54	0	5.83	90.56	1	0.16
2	119.92	0.14	0.46	55	0.01	0.23	36	0.00
3	179.88	10.58	34.65	-167	2.23	34.63	-167	0.02
4	239.85	0.03	0.10	-26	0.01	0.10	-101	0.00
5	299.81	4.76	15.58	119	1.01	15.65	117	0.00
6	359.77	0.06	0.20	166	0.01	0.13	158	0.00
7	419.73	2.98	9.78	-2	0.63	9.71	-4	0.00
8	479.69	0.05	0.18	134	0.01	0.11	76	0.00
9	539.65	2.72	8.91	-88	0.57	8.92	-91	0.00
10	599.62	0.04	0.13	-58	0.01	0.14	-57	0.00
11	659.58	1.73	5.68	174	0.37	5.74	170	0.00
12	719.54	0.04	0.13	-112	0.01	0.11	-148	0.00
13	779.50	1.95	6.40	70	0.40	6.23	65	0.00
14	839.46	0.01	0.03	0	0.01	0.09	107	0.00
15	899.42	1.38	4.53	-32	0.29	4.46	-36	0.00
16	959.38	0.04	0.13	31	0.01	0.11	23	0.00
17	1019.35	1.11	3.63	-129	0.23	3.61	-134	0.00
18	1079.31	0.02	0.08	0	0.00	0.08	-64	0.00
19	1139.27	1.22	3.99	139	0.26	4.00	134	0.00
20	1199.23	0.02	0.05	-147	0.01	0.11	-172	0.00
21	1259.19	1.10	3.61	32	0.22	3.48	24	0.00
22	1319.15	0.03	0.10	118	0.01	0.11	97	0.00
23	1379.12	0.86	2.81	-74	0.18	2.76	-81	0.00
24	1439.08	0.02	0.08	15	0.01	0.11	-19	0.00
25	1499.04	0.82	2.69	-155	0.16	2.56	-164	0.00
26	1559.00	0.05	0.15	-90	0.01	0.14	-104	0.00
27	1618.96	0.88	2.87	95	0.18	2.81	88	0.00
28	1678.92	0.04	0.13	-175	0.01	0.14	158	0.00
29	1738.88	0.79	2.58	-11	0.16	2.48	-21	0.00
30	1798.85	0.05	0.15	58	0.01	0.16	48	0.00
31	1858.81	0.55	1.82	-106	0.11	1.79	-114	0.00



FA-10041 VASI  
Low Step  
Single Lamp Readings





FA-10041 VASI  
Low Step  
Single Lamp Readings

## Single Phase Readings - 05/03/00 10:05:52

FA-10041 VASI  
Low Step  
Single Lamp Readings

## Summary Information

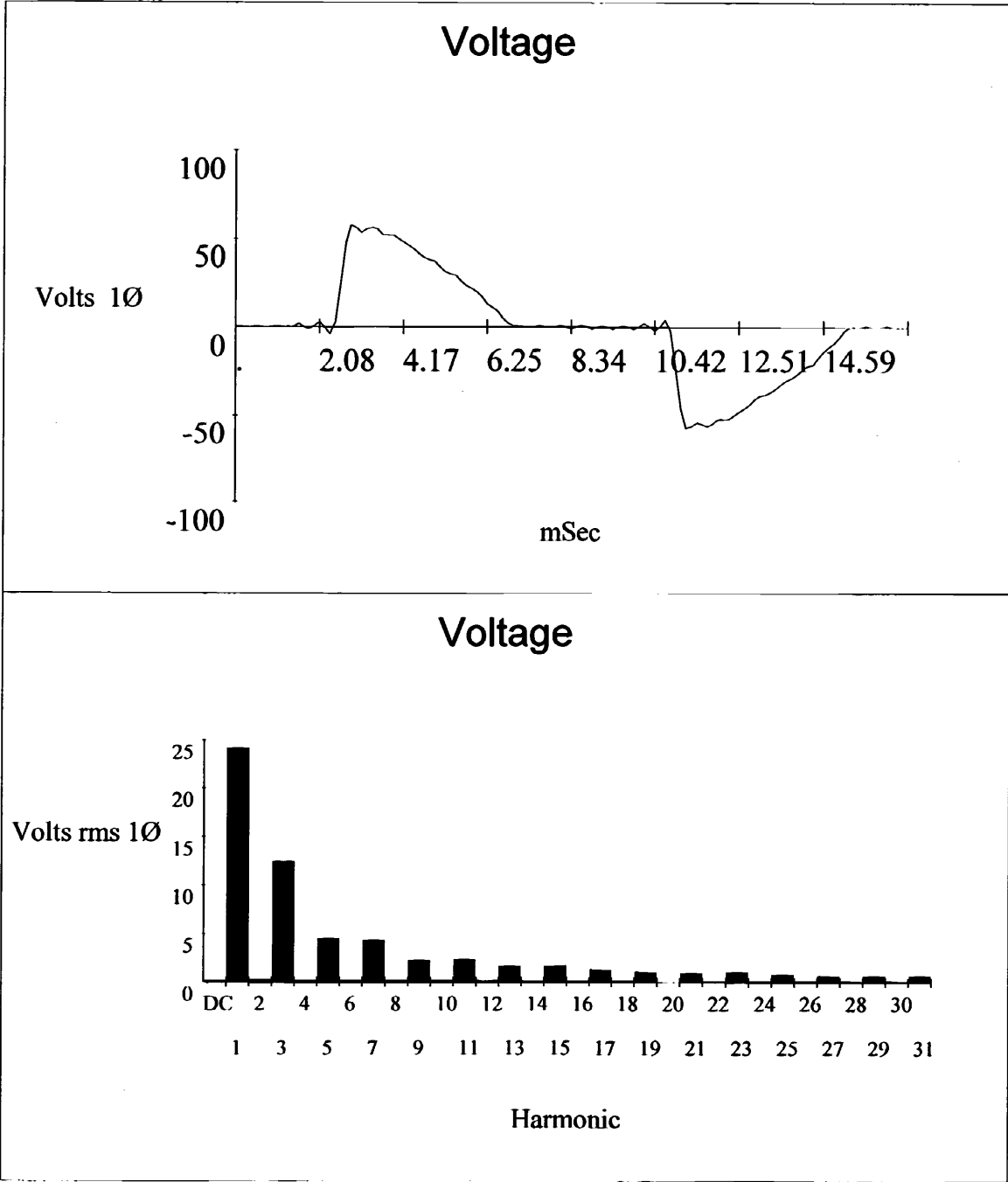
			Voltage	Current
Frequency	59.96	RMS	14.24	4.24
Power (1 Phase)		Peak	39.93	11.94
KW	0.06	DC Offset	0.20	-0.02
KVA	0.06	Crest	2.8	2.82
KVAR	0.00	THD Rms	72.04	71.73
Peak KW	0.48	THD Fund	103.88	102.96
Phase	1° lead	HRMS	10.14	3.01
Total PF	1.00	KFactor		21.08
DPF	1.00			

## Record Information

	Max	Average	Min
V RMS			
A RMS			
V Peak			
A Peak			
V THD-R%			
A THD-R%			
KWatts			
KVA			
TPF			
DPF			
Frequency			

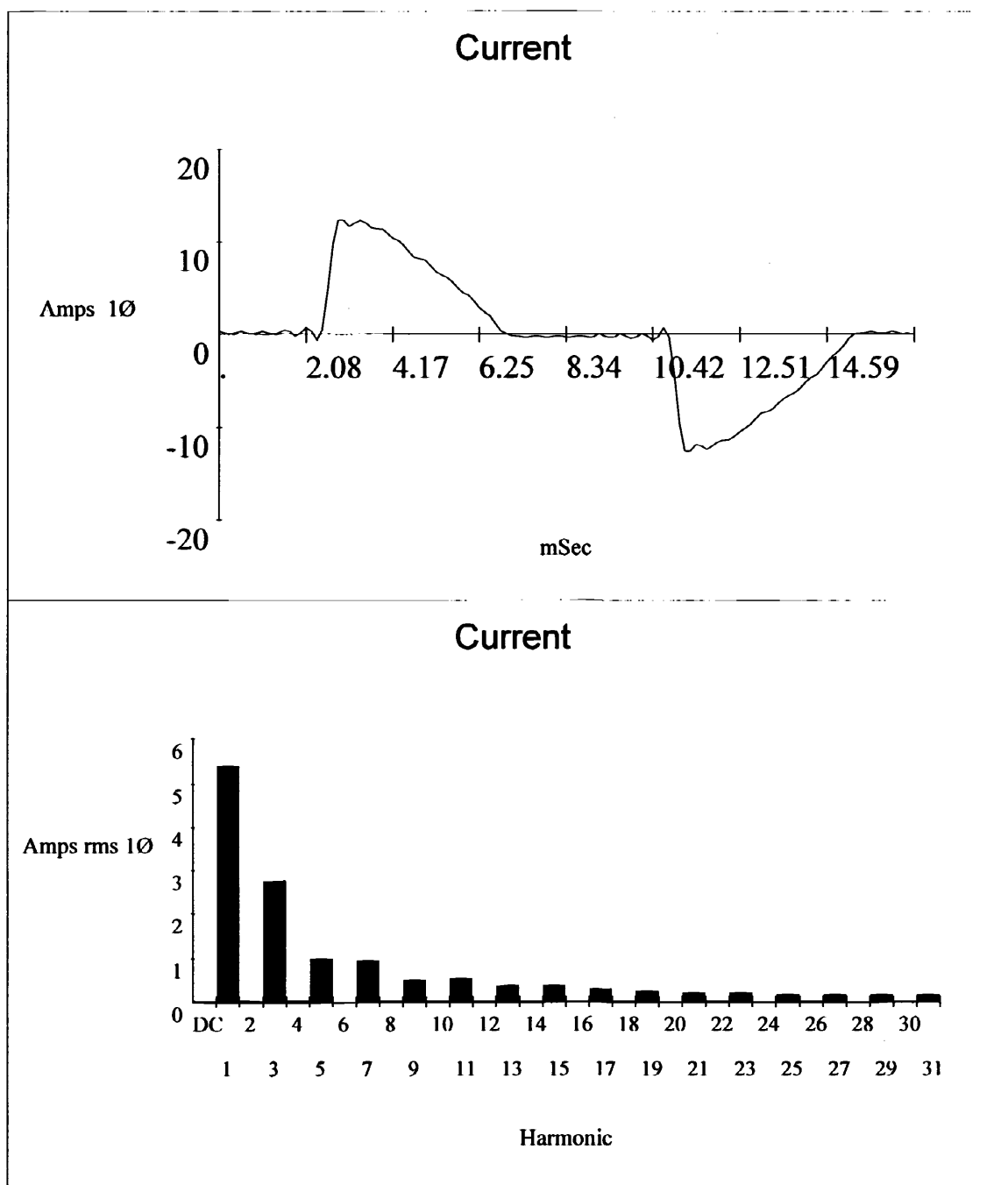
## Harmonic Information

	Freq.	V Mag	%V RMS	1 Phase V Ø°	I Mag	%I RMS	1 Phase I Ø°	1 Phase Power (KW)
DC	0.00	0.20	1.43	0	0.02	0.41	0	0.00
1	59.96	9.77	68.59	0	2.92	68.90	1	0.03
2	119.92	0.05	0.33	77	0.01	0.15	-53	0.00
3	179.88	7.78	54.65	180	2.31	54.51	179	0.02
4	239.85	0.09	0.66	-146	0.01	0.28	174	0.00
5	299.81	4.82	33.86	6	1.43	33.74	5	0.01
6	359.77	0.05	0.38	22	0.01	0.29	13	0.00
7	419.73	2.40	16.85	-146	0.71	16.82	-148	0.00
8	479.69	0.00	0.00	14	0.01	0.28	-135	0.00
9	539.65	1.88	13.17	89	0.55	13.05	86	0.00
10	599.62	0.05	0.33	129	0.01	0.27	79	0.00
11	659.58	1.87	13.11	-60	0.55	12.90	-65	0.00
12	719.54	0.05	0.38	-58	0.01	0.28	-77	0.00
13	779.50	1.40	9.82	147	0.41	9.71	142	0.00
14	839.46	0.06	0.44	140	0.01	0.24	137	0.00
15	899.42	1.05	7.41	9	0.31	7.27	4	0.00
16	959.38	0.05	0.33	36	0.01	0.29	0	0.00
17	1019.35	0.99	6.97	-134	0.29	6.87	-139	0.00
18	1079.31	0.05	0.33	-148	0.01	0.28	-153	0.00
19	1139.27	0.83	5.82	79	0.24	5.75	72	0.00
20	1199.23	0.05	0.33	68	0.01	0.31	59	0.00
21	1259.19	0.67	4.72	-60	0.19	4.53	-70	0.00
22	1319.15	0.03	0.22	-82	0.01	0.29	-89	0.00
23	1379.12	0.63	4.44	159	0.18	4.25	150	0.00
24	1439.08	0.04	0.27	148	0.01	0.31	125	0.00
25	1499.04	0.54	3.79	11	0.16	3.76	1	0.00
26	1559.00	0.05	0.33	-19	0.01	0.28	-27	0.00
27	1618.96	0.41	2.85	-131	0.12	2.87	-142	0.00
28	1678.92	0.05	0.33	172	0.01	0.25	-165	0.00
29	1738.88	0.37	2.58	93	0.11	2.59	82	0.00
30	1798.85	0.05	0.38	77	0.01	0.28	51	0.00
31	1858.81	0.37	2.58	-49	0.10	2.37	-65	0.00



Godfrey Built AVW PAPI  
High Step

# Single Phase Readings - 01/06/00 10:52:30



Godfrey Built AVW PAPI  
High Step

## Single Phase Readings - 01/06/00 10:52:30

Godfrey Built AVW PAPI  
High Step

## Summary Information

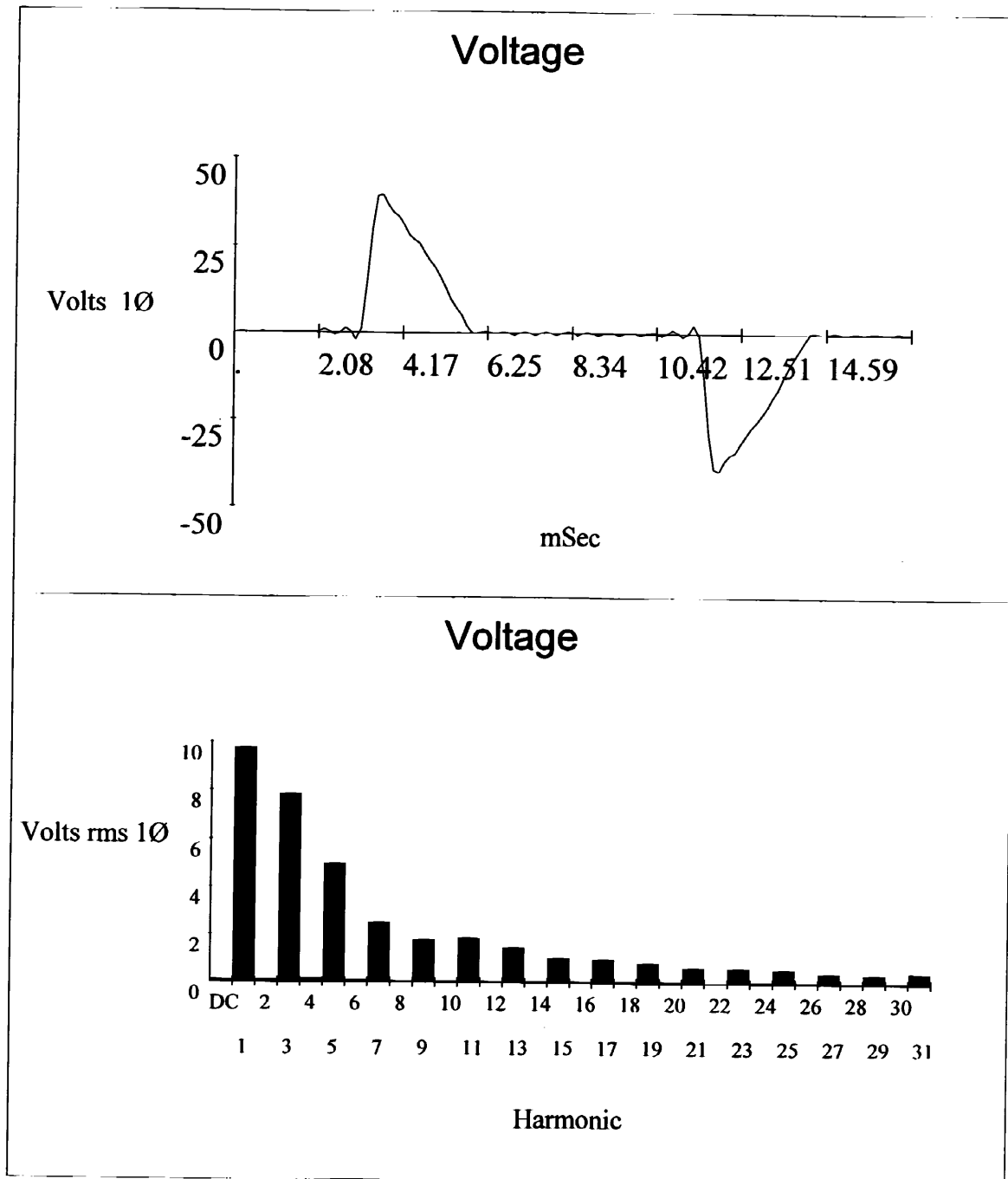
		Voltage	Current
Frequency	59.96	RMS 28.29	6.31
Power (1 Phase)		Peak 57.39	12.80
KW	0.18	DC Offset 0.08	-0.03
KVA	0.18	Crest 2.03	2.03
KVAR	0.00	THD Rms 51.76	51.81
Peak KW	0.73	THD Fund 60.49	60.58
Phase	1° lead	HRMS 14.62	3.27
Total PF	1.00	KFactor	11.17
DPF	1.00		

## Record Information

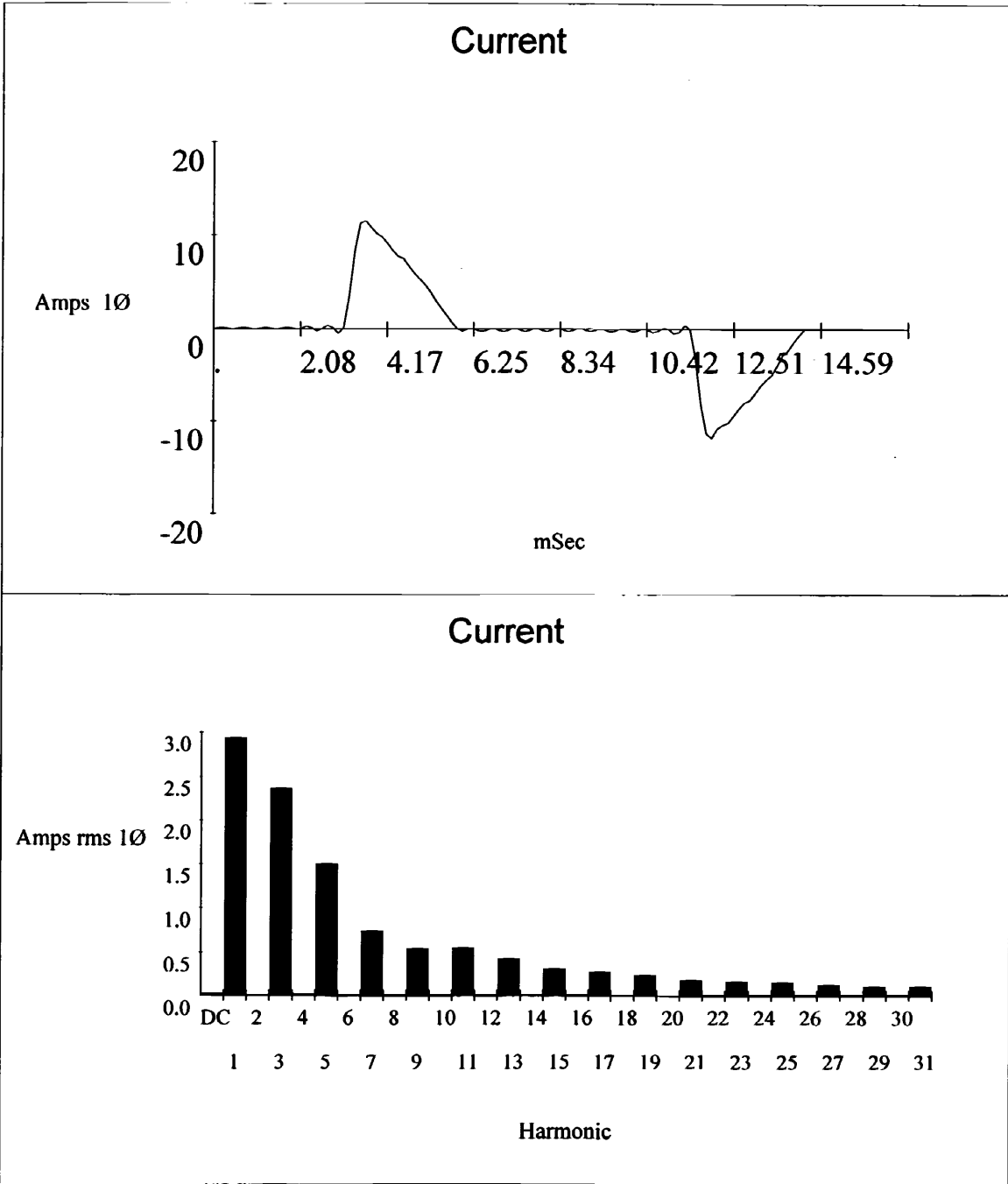
Max	Average	Min
V RMS		
A RMS		
V Peak		
A Peak		
V THD-R%		
A THD-R%		
KWatts		
KVA		
TPF		
DPF		
Frequency		

## Harmonic Information

	Freq.	V Mag	%V RMS	1 Phase V Ø°	I Mag	%I RMS	1 Phase I Ø°	1 Phase Power (KW)
DC	0.00	0.08	0.28	0	0.03	0.48	0	0.00
1	59.96	24.17	85.44	0	5.39	85.46	1	0.13
2	119.92	0.18	0.64	45	0.02	0.31	19	0.00
3	179.88	12.38	43.74	-172	2.77	43.86	-173	0.03
4	239.85	0.09	0.33	178	0.02	0.29	-172	0.00
5	299.81	4.45	15.71	79	1.00	15.77	78	0.00
6	359.77	0.05	0.19	-158	0.00	0.01	50	0.00
7	419.73	4.24	15.00	-45	0.94	14.98	-48	0.00
8	479.69	0.05	0.17	31	0.01	0.17	27	0.00
9	539.65	2.20	7.79	-153	0.50	7.90	-155	0.00
10	599.62	0.06	0.22	-95	0.01	0.15	-119	0.00
11	659.58	2.34	8.26	94	0.52	8.24	90	0.00
12	719.54	0.04	0.14	133	0.01	0.14	139	0.00
13	779.50	1.66	5.85	-15	0.37	5.84	-21	0.00
14	839.46	0.07	0.25	20	0.01	0.16	18	0.00
15	899.42	1.68	5.94	-134	0.37	5.85	-139	0.00
16	959.38	0.04	0.14	-86	0.01	0.15	-101	0.00
17	1019.35	1.26	4.45	114	0.28	4.38	108	0.00
18	1079.31	0.04	0.14	150	0.01	0.15	131	0.00
19	1139.27	1.09	3.87	-1	0.24	3.84	-7	0.00
20	1199.23	0.01	0.03	15	0.01	0.10	29	0.00
21	1259.19	0.99	3.51	-103	0.22	3.45	-111	0.00
22	1319.15	0.05	0.17	-57	0.01	0.16	-89	0.00
23	1379.12	1.01	3.56	138	0.22	3.51	129	0.00
24	1439.08	0.03	0.11	144	0.01	0.10	138	0.00
25	1499.04	0.87	3.07	24	0.19	3.00	15	0.00
26	1559.00	0.05	0.19	77	0.01	0.11	56	0.00
27	1618.96	0.73	2.57	-96	0.16	2.48	-104	0.00
28	1678.92	0.03	0.11	-51	0.01	0.09	-70	0.00
29	1738.88	0.66	2.32	168	0.14	2.27	158	0.00
30	1798.85	0.04	0.14	-150	0.01	0.13	-176	0.00
31	1858.81	0.72	2.54	49	0.15	2.44	40	0.00



Godfrey Built AVW PAPI  
LOW STEP



Godfrey Built AVW PAPI  
LOW STEP

## Single Phase Readings - 01/06/00 10:49:31

Godfrey Built AVW PAPI  
LOW STEP

## Summary Information

			Voltage	Current
Frequency	59.96	RMS	14.22	4.26
Power (1 Phase)		Peak	39.50	11.90
Watts	60.00	DC Offset	0.10	-0.02
VA	60.00	Crest	2.78	2.79
Vars	0.00	THD Rms	72.52	72.39
Peak W	474.00	THD Fund	105.33	104.93
Phase	1° lead	HRMS	10.30	3.08
Total PF	1.00	KFactor		20.90
DPF	1.00			

## Record Information

	Max	Average	Min
V RMS			
A RMS			
V Peak			
A Peak			
V THD-R%			
A THD-R%			
Watts			
Volt * Amps			
TPF			
DPF			
Frequency			

## Harmonic Information

	Freq.	V Mag	%V RMS	1 Phase V Ø°	I Mag	%I RMS	1 Phase I Ø°	1 Phase Power (W)
DC	0.00	0.10	0.71	0	0.02	0.50	0	0.00
1	59.96	9.78	68.78	0	2.94	68.93	1	28.64
2	119.92	0.07	0.49	79	0.01	0.28	69	0.00
3	179.88	7.88	55.43	180	2.37	55.48	179	18.56
4	239.85	0.12	0.82	-120	0.02	0.41	-129	0.00
5	299.81	4.98	34.99	7	1.50	35.06	5	7.36
6	359.77	0.09	0.60	67	0.02	0.37	48	0.00
7	419.73	2.52	17.69	-148	0.75	17.47	-151	1.76
8	479.69	0.04	0.27	-110	0.01	0.35	-115	0.00
9	539.65	1.77	12.47	86	0.53	12.49	84	0.80
10	599.62	0.02	0.16	106	0.01	0.29	81	0.00
11	659.58	1.84	12.97	-60	0.55	12.81	-64	0.96
12	719.54	0.03	0.22	-46	0.01	0.15	-65	0.00
13	779.50	1.45	10.22	146	0.42	9.97	142	0.48
14	839.46	0.02	0.11	-165	0.01	0.16	-179	0.00
15	899.42	1.03	7.25	6	0.31	7.17	1	0.16
16	959.38	0.04	0.27	58	0.01	0.19	20	0.00
17	1019.35	0.94	6.59	-133	0.28	6.52	-139	0.16
18	1079.31	0.02	0.11	-136	0.01	0.15	-151	0.00
19	1139.27	0.82	5.77	79	0.24	5.66	74	0.16
20	1199.23	0.02	0.11	89	0.00	0.04	97	0.00
21	1259.19	0.63	4.45	-60	0.19	4.38	-68	0.00
22	1319.15	0.01	0.05	143	0.00	0.12	-10	0.00
23	1379.12	0.61	4.29	163	0.18	4.16	156	0.00
24	1439.08	0.03	0.22	-131	0.01	0.13	-171	0.00
25	1499.04	0.55	3.90	15	0.16	3.80	8	0.00
26	1559.00	0.05	0.38	28	0.01	0.15	42	0.00
27	1618.96	0.41	2.91	-127	0.12	2.92	-134	0.00
28	1678.92	0.01	0.05	-44	0.00	0.12	-86	0.00
29	1738.88	0.38	2.64	103	0.11	2.65	94	0.00
30	1798.85	0.02	0.16	125	0.01	0.13	139	0.00
31	1858.81	0.41	2.86	-39	0.11	2.68	-50	0.00